

**EPA Superfund
Record of Decision:**

**NORFOLK NAVAL BASE (SEWELLS POINT NAVAL
COMPLEX)**

EPA ID: VA6170061463

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NORFOLK, VA

09/23/2004

**Final
Record of Decision**

Site 22: Camp Allen Salvage Yard

**Naval Station Norfolk
Norfolk, Virginia**



Prepared by

**Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia**

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CAL	Camp Allen Landfill
CASY	Camp Allen Salvage Yard
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EE/CA	Engineering Evaluation/Cost Analysis
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IAS	Initial Assessment Study
ILCR	Incremental Lifetime Cancer Risk
IRP	Installation Restoration Program
LUC	Land Use Control
Navy	United States Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NSN	Naval Station Norfolk
NTCRA	Non-Time-Critical Removal Action
O&M	Operation and Maintenance
PA/SI	Preliminary Assessment/Site Inspection
PCB	Polychlorinated Biphenyl
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RI	Remedial Investigation
RME	Reasonable Maximum Exposures
ROD	Record of Decision
SVOC	Semivolatile Organic Compound
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound

1.0 DECLARATION

1.1 Site Name and Location

Site 22 Camp Allen Salvage Yard (CASY)
Naval Station Norfolk (NSN), Norfolk, Virginia
United States Environmental Protection Agency (USEPA) ID: VA6170061463

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the selected remedy for Site 22, the CASY, located at NSN, Norfolk, Virginia. This determination has been made in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The United States Department of the Navy (Navy) and the USEPA Region III issue this ROD jointly. The Commonwealth of Virginia concurs with the selected remedy.

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment from the site.

1.4 Description of the Selected Remedy

The selected remedy to address contaminated soil and sediment at the CASY is land use controls (LUCs). The selected remedy was determined based on the evaluation of site conditions, site-related risks, applicable or relevant and appropriate requirements (ARARs), and Remedial Action Objectives (RAOs).

Creating land use controls provides the best alternative for eliminating current and future exposure pathways to on-site contaminants. Consequently, the land use control objectives are:

- Prohibit the development and use of the property for residential housing, elementary and secondary schools, child-care facilities, or other activities that would pose an unacceptable risk to human and environmental receptors.
- Ensure no construction and maintenance activities, including activities that involve digging into the existing soil cover, are undertaken until the Navy institutes adequate base procedures to ensure the integrity of the soil cover. These base procedures must be in place within 90 days of ROD signature. Within this 90-day timeframe, if the Navy wishes to engage in digging or maintenance activities that impact the soil cover, the Navy must secure USEPA and Virginia Department of Environmental Quality (VDEQ) concurrence.

The LUCs will remain until contaminant levels diminish so as to allow unrestricted use and unlimited exposure. Within 90 days following the execution of this ROD, the Navy shall develop, and submit to the USEPA and VDEQ, in accordance with the Federal Facilities Agreement, a Remedial Design that shall provide for land use control implementation and maintenance actions, including periodic inspections and reporting, to ensure that residential development will not be allowed on the site. The Navy will implement, maintain, monitor, and enforce the LUCs according to the Remedial Design. These actions

will reduce unacceptable risks to receptors by eliminating direct exposure to contaminated soil and sediment.

1.5 Statutory Determination

This selected remedy is protective of human health and the environment, complies with Federal and Commonwealth of Virginia regulations that are applicable or relevant and appropriate to the remedial action, and is cost-effective. The soil and sediment remedies do not follow the statutory preference for treatment as a principal element for the following reason. The remaining hazardous substances in these media occur at levels that pose long-term threats to human health and the environment and treatment of the remaining hazardous substances in the soil and sediment at this site in a cost-effective manner is not practicable. Therefore, the selected remedy is a better balance of tradeoffs under the statutory evaluation criteria than alternatives using treatment.

Since the remedy for soil and sediment will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted, at a minimum, every five years, consistent with Section 121(c) of CERCLA, 42 U.S.C. §9621(c), after commencement of the remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment.

1.6 Record of Decision Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information for Site 22 can be found in the Administrative Record for NSN.

- Contaminants of concern (COCs) and their respective concentrations.
- Baseline risks associated with the COCs.
- Remediation levels established for COCs and the basis for these levels.
- How source materials constituting principal threats are addressed.
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the risk assessments and ROD.
- Potential land use that will be available at the site as a result of the selected remedy.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected.
- Key factors that led to the selection of the remedy.



F.F. Aucremanne, CAPT, CEC, USN
Chief of Staff
Commander, Navy Region Mid-Atlantic

14 SEPT 04

Date



Abraham Ferdas, Director
Hazardous Site Cleanup Division
United States Environmental Protection Agency, Region III

9/23/04

Date

2.0 DECISION SUMMARY

This ROD describes the Navy's and the USEPA's selected remedial action for Site 22, the CASY, at NSN, Norfolk, Virginia. The Navy is the lead agency under CERCLA and provides funding for site cleanups. The CASY is one of several Installation Restoration Program (IRP) sites located at NSN.

2.1 Site Name, Location, and Description

Site 22, referred to as the Camp Allen Salvage Yard, is located within the property boundary of NSN, south of the Naval Station airfield and Interstate 564 in the area known as Camp Allen as shown on Figures 2-1 and 2-2. The site lies between Areas A and B of the Camp Allen Landfill (CAL) with Ingersol Street bordering the western to northeastern portions of the site. Site 22 includes an area of approximately 22 acres of level ground. The site was used as a storage and salvage yard, and numerous pieces of spare military equipment, old vehicle parts, and discarded electronic equipment were stored at the site. All of the site salvage and storage areas, structures, and buildings active during the salvaging process have been demolished and removed.

There is a storm water drainage basin, or "pond," that adjoins the eastern side of the site, north of CAL Area B. This pond collects storm water that drains into a storm sewer that crosses the site. The storm sewer discharges into a ditch on the north side of the site which leads to Bousch Creek. In May 1999, at the Navy's request, the U.S. Army Corps of Engineers inspected the site, and verified that the pond area is considered upland property, and, therefore, is not within the Army Corps jurisdiction as a wetland.

2.2 Site History and Enforcement Activities

2.2.1 Site History

Historically, the site and surrounding area were covered with strands of hardwoods and vast areas of tidal marsh. Development of the Naval Station has greatly altered the original terrain. The Navy filled much of the Camp Allen area to allow for site development and used the site as a salvage yard for over 50 years. The facility was once dedicated to the salvaging and disposal of scrap materials generated by the Navy in the Tidewater area. The Navy managed the facility from 1940 until 1972. From 1972 until 1995, the site was managed by the Defense Reutilization and Marketing Services. In 1995, use of the facility for the handling of scrap materials was discontinued. After the site was closed, the Navy initiated a Remedial Investigation (RI) in 1996. As noted, Site 22 was one of several IRP sites at NSN included in the National Priorities List (NPL).

2.2.2 History of Previous Investigations and Removals

Several environmental investigations have been performed at Site 22 and within the immediate vicinity. These investigations are discussed in the following sections.

2.2.2.1 Initial Assessment Study

In April of 1982, an Initial Assessment Study (IAS) was conducted at the Sewell's Point Naval Complex, Naval Station Norfolk, Virginia. The IAS identified 18 sites of concern with regard to potential contamination. Site 22 was included as a potential area of concern (Naval Energy and Environmental Support Activity, 1983).

2.2.2.2 Preliminary Assessment/Site Inspection

A Preliminary Assessment/Site Inspection (PA/SI) was performed at Site 22 in January 1993. The PA/SI reviewed historical information for the site and included the collection of 20 surface and 20 subsurface soil samples. The contaminants detected in the soil samples included polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons, and inorganics (Baker, 1993). Based on the results of the PA/SI, Site 22 was added to the list of sites of concern.

2.2.2.3 CAL Remedial Investigation and Feasibility Study

Remedial Investigation/Feasibility Study (RI/FS) field activities associated with CAL Areas A and B were performed in 1993 and 1994 to characterize past disposal activities (Baker, 1994a and 1994b). These investigations detected volatile organic compounds (VOCs) in both the soil and groundwater. Based on the results of the RI, the Navy completed a FS and in 1995 issued a Decision Document (Baker, 1995) that addressed the cleanup of contaminated soil at the CAL and the cleanup of the groundwater for the Camp Allen area.

2.2.2.4 CAL Area B Soil and Debris Removal Action

Based on the results of the CAL RI/FS, the Navy completed a soil and debris removal action at CAL Area B in January 1995. Approximately 11,500 tons of contaminated soil and debris were removed from CAL Area B.

2.2.2.5 CAL Area A and B Groundwater Remediation

In July 1997, a groundwater remediation system was placed in operation. This system collects and treats VOCs in the groundwater underlying CAL Areas A and B and the Camp Allen Salvage Yard. The groundwater treatment system also removes suspended solids in the groundwater to minimize fouling of the treatment system.

2.2.2.6 CASY Remedial Investigation

The CASY RI field effort was performed in two phases. Phase I was conducted in July 1996 and included a geophysical survey, surface and subsurface soil sampling, and a groundwater survey using the GeoprobeTM in-situ sampling technique. Phase II was conducted in August 1996 and consisted of the installation of two groundwater monitoring wells, well development and associated groundwater sampling activities, surface water and sediment sampling, water level measurements, and site surveying (Baker, 1999). Results of the RI indicated that:

- SVOCs, pesticides, PCBs, and metals had impacted surface and subsurface soil. PCB concentrations exceeding screening values were found in both surface and subsurface soil, primarily in the southern half of the site.
- Storm water samples in drains at the site contained levels of arsenic that exceeded Federal Water Quality Criteria. These samples were collected from the storm drains located from the northern end of the site.
- Sediment samples collected from the storm drain and from the pond adjacent to the CASY contained arsenic, pesticides, and PCBs at levels above USEPA's risk-based concentrations and/or effects range-medium screening values.
- Groundwater samples collected during the RI identified Contaminants of Potential Concern including antimony, arsenic, and iron at levels above the USEPA Maximum Contaminant Levels and Virginia Drinking Water Standards.

- Based on the available information and analytical data, the major impacted areas within the site appear to have been in the southern portion of the site.

2.2.2.7 CASY Non-Time-Critical Removal Action for PCB-Contaminated Soil

In September 1997, the Navy performed an Engineering Evaluation/Cost Analysis (EE/CA) addressing PCBs at Site 22 and issued a public notice of a proposed non-time-critical removal action (NTCRA). The intent of this action was to remove PCB-contaminated soil from the site. A public information meeting was held and no comments were received. In August 1998, the Navy initiated a NTCRA in which more than 4,100 tons of PCB-contaminated soil exceeding cleanup goals were removed from the southern portion of the site (Baker, 1997).

In 2001, based on the results of the initial PCB removal, a metals “hot spot” investigation was conducted to further delineate and characterize the nature and extent of antimony, arsenic, iron, and lead contamination in soil at Site 22. Six hot spot areas, totaling approximately 4,800 cubic yards of metals-and PCB-contaminated soil, were identified. In 2001, more than 16,000 cubic yards of metals - and PCB-contaminated soil were removed and sent off-site for disposal (Baker, 2001).

The EE/CA prepared for the NTCRA included an evaluation of ARARs. The NTCRA complied with the Federal and Commonwealth ARARs listed in the EE/CA.

2.2.2.8 CASY Feasibility Study

A FS was completed in 2002 to investigate and compare potential alternative remedies (Baker, 2002a). The FS evaluated various treatment and disposal options for contaminated soil, sediment, and groundwater.

2.2.2.9 ASY Non-Time-Critical Removal Action for Metals-Contaminated Soil

As part of the confirmation sampling associated with the 2001 PCB and hot spot removal actions, more extensive and widespread metals contamination was identified at Site 22. In early 2002, the Navy completed an EE/CA addressing the metals contamination and issued a public notice of a proposed NTCRA. The public comment period of the EE/CA ended on March 4, 2002 and no comments were received. In November 2002, the Navy completed placement of a 1-foot vegetated soil cover over the entire 22-acre site to reduce potential human and ecological exposure to metals contamination (Baker, 2002b). The NTCRA complied with the Federal and Commonwealth ARARs listed in the EE/CA and the FS.

2.2.2.10 CASY Non-Time-Critical Removal Action for Contaminated Sediment in the Pond Area

In July 2003, the Navy completed an EE/CA addressing contaminated sediment in the pond area adjacent to the CASY and issued a public notice of a proposed NTCRA. The removal action included the removal of approximately 1,825 cubic yards of contaminated sediment, the installation of a compacted one-foot cover of soil, and installation of a cellular concrete block system over a geotextile which covered the remaining contaminated pond sediment. The one-foot soil cover was installed to reduce potential exposure to ecological receptors (Baker, 2003). The NTCRA complied with the Federal and Commonwealth ARARs listed in the EE/CA and the FS.

2.2.2.11 CASY Proposed Plan

In 2004, the Navy completed a Proposed Plan addressing the final remedy for soil and sediment at the site. The Proposed Plan was made available to the public in February 2004. Comments received during the public review period are further discussed in Section 3.0.

2.2.3 Enforcement Activities

NSN was placed on the NPL in 1997. No enforcement activities have been recorded to date at the site.

2.3 Highlights of Community Participation

The NSN Restoration Advisory Board (RAB) was formed in 1997. The RAB provides a forum for the exchange of information among community members, the USEPA, the VDEQ, and the Navy. In addition, a Community Relations Program is conducted as part of the installation restoration process. Public input is a key element in the decision making process. The status and a summary of the findings from the Site 22 remedial investigations were most recently presented to the RAB on November 19, 2003.

The Proposed Plan for Site 22 was made available to the public in February 2004. The Proposed Plan presented to the public addressed the preferred alternative for soil and sediment at the site. The Proposed Plan and supporting documents can be found in the administrative record for NSN. Information for this site can be found at:

Kim Memorial Branch
Norfolk Public Library
301 East City Hall Avenue
Norfolk, Virginia 23510
(757) 664-7323

The notice of availability of the Proposed Plan was published in *The Virginian-Pilot* on February 8, 2004. A public comment period was held from February 8, 2004 through March 7, 2004. In addition, a public meeting was held on March 2, 2004 at the Navy Lodge on Hampton Boulevard to inform interested members of the community about preferred remedial alternatives under consideration and to seek public comments. At this meeting, representatives from USEPA Region III, the Commonwealth of Virginia, and the Navy were available to answer questions about Site 22 and the remedial alternatives available for the site.

2.4 Scope and Role of the Remedy

The proposed remedial actions for Site 22 are based on information obtained from remedial field investigations, data analysis, risk assessment, and take into account the Navy's future plans for the site. The selected remedy identified in this ROD addresses contaminated soil and sediment at the site as identified in the RI and FS reports, and composes the overall soil and sediment cleanup strategy for the site.

The selected remedy will reduce the potential risk to human health and the environment associated with soil and sediment at Site 22 and is consistent with the long-term remedial goals for Site 22. The remedy includes land use controls for soil and sediment at the site. Within 90 days following the execution of this ROD, the Navy shall develop, and submit to the USEPA and VDEQ, in accordance with the Federal Facilities Agreement, a Remedial Design that shall provide for land use control implementation and

maintenance actions, including periodic inspections and reporting, to ensure that residential development will not be allowed on the site.

2.5 Summary of Site Characteristics

This section provides a summary of the features of the site and of the nature and extent of soil and sediment contamination at the site. This ROD only addresses soil and sediment at the site, groundwater will be addressed in a separate document through the CERCLA process. Surface water has been included with sediment for purposes of remedial alternative development and evaluation.

Soil - The site geology was delineated based on previously documented geologic information, RI boring logs, monitoring well installations, and direct-push soil sampling results. Typically, the upper five feet consists of medium-brown to orange-brown sandy fill intermixed with construction debris and ash material. The material from 5 feet to approximately 25 feet below ground surface is composed of medium-brown to gray silty sands with occasional shell fragments.

Sediment/Surface Water - The pond contains sediment that consists of coarse to fine sand, silt, and silty clay, intermixed with organic debris. A medium-brown to gray silty sand underlies the sediment; a watery mud mixed with organic matter overlies the sediment in some areas. Surface water runoff from Site 22 enters storm sewer catch basins on the site, or flows eastward into the pond, or flows northward toward the drainage ditch on the north side of Ingersol Street. Downstream of the site, this drainage ditch intersects another ditch flowing in a perpendicular direction, and ultimately flows into Bousch Creek.

2.5.1 Sources of Contamination

Based on site history, previous investigations and RI findings, contamination from prior disposal practices and operating procedures at Site 22 have impacted surface and subsurface soil and sediment to various degrees. In general, the primary COCs are several inorganic constituents, and to a lesser extent, specific SVOCs, pesticides, and PCBs. A brief summary of the nature and extent of contamination focusing on the primary COCs associated with each medium is presented below but is not intended to address all results in detail. Detailed findings and data evaluation are presented in Sections 5.0 and 6.0 of the RI Report (Baker, 1999).

2.5.2 Description of Contamination

Based on the available information and analytical data, the major disposal areas for Site 22 appear to have been in the southern portion of the site, including the Southern Area, Former Scrap Area, and Former PCB Spill area (Figure 2-3). A geophysical investigation indicated metal disposal at various locations across the site. The COCs associated with the disposal areas are primarily inorganic and organic constituents.

Surface and Subsurface Soil - Analytical results indicated surface and subsurface soil to be nominally impacted by disposal activities. Specifically, SVOCs, pesticides, PCBs, and inorganics have, to some extent, impacted the surface and subsurface soil. While most concentrations were below screening values, PCB concentrations exceeding screening values were found in both surface and subsurface soil, primarily in the southern half of the site. These soil and some metals-contaminated hot spots were removed to cleanup levels as part of the removal actions. Following the removal actions, the concentrations of antimony and PCBs remaining at the site were below cleanup levels. Inorganics (arsenic, iron, and lead) above screening values outside of the hot spots were remediated through the NTCRA that included placement of a 1-foot vegetated soil cover over the entire 22-acre site.

Sediment -Analytical results indicate isolated, sporadic areas of various inorganic (principally arsenic) and pesticide/PCB constituent concentrations (dieldrin, Aroclor-1260) at levels above screening values. Sediment samples were collected from the storm drain located in the northern part of the site and from the pond area adjacent to the CASY. Storm drain sediments were collected and disposed of in 2002. A permanent sediment trap was installed to minimize movement of pond sediment into the storm sewer system. In 2003, a removal action was completed that included the removal of 1,825 cubic yards of contaminated sediment, the installation of a compacted 1-foot cover of soil, and the installation of a cellular concrete block system over a geotextile which covered the remaining contaminated pond sediment. The one-foot soil cover was installed to reduce potential exposure to ecological receptors.

Surface Water - Analytical results indicate inorganic (principally arsenic and magnesium) constituent concentrations exceeding Federal Water Quality Criteria and Virginia Water Quality standards. These samples were collected from the storm drains located in the northern part of the site, which were flushed and cleaned in 2002.

2.5.3 Contaminant Migration

As noted previously, the Navy completed a NTCRA which removed PCB- and inorganic-contaminated soil from Site 22. In addition, a soil cover was placed over the remaining contaminated soil and under a separate action, a cover was placed over the contaminated sediment in the pond area. These three NTCRAs have minimized the potential for risks posed by migration. Some transport of particulate bound contaminants into the pond has occurred via surface water runoff and erosion, as evidenced by the relatively high levels of inorganic contaminants detected in sediment and surface water. In 2002, the storm sewer system was flushed and all sediments were removed. A permanent sediment trap was installed to minimize movement of pond sediments into the storm sewer system. The Navy currently operates a Groundwater Treatment Plant at the CAL, which includes groundwater recovery wells that surround Site 22, and minimizes contaminant migration off-site. In addition, the soil cover over the 22-acre site and the sediment cover over the pond area further reduces potential contaminant migration by limiting surface water infiltration.

2.6 Current and Potential-Future Land and Resource Uses

The Navy is currently not using the site and has no plans to construct housing units on the site. At this time, the Navy intends to use the site as a recreational area. The Navy has no plans to use the groundwater underlying the site for any purposes. The City of Norfolk prohibits the use of the water table aquifer as a potable water source at locations such as CASY, which can be connected to the City of Norfolk Public Water Supply System (Section 46.1-5 of the City of Norfolk Ordinance).

2.7 Summary of Site Risks Before Removal Actions

The public health risks associated with exposure to contaminated media within Site 22 were evaluated in a Human Health Risk Assessment (HHRA) that was presented in the RI Report (Baker, 1999). The risk assessment was subsequently updated in 2000 and this revised HHRA was presented in the FS Report (Baker, 2002a). The updated HHRA was conducted in accordance with USEPA's *Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual, Parts A and D* (USEPA, 1989 and 1998). The HHRA evaluated and assessed the potential public health risks that might result under current and potential future land use scenarios. A summary of the public health risks associated with the site and the Navy's approach to evaluating and addressing ecological risks is presented below. Based on this information, the response action selected in this ROD is necessary to protect the public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment.

2.7.1 Human Health Risk Assessment

2.7.1.1 Objectives and Background of Human Health Risk Assessment

The HHRA evaluated the public health risks associated with exposure to contaminated media within Site 22 if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways to be addressed by remedial action. The HHRA evaluated the public health risks associated with exposure to contaminated media at the site based on contaminant data collected before the removal actions including the placement of a one-foot cover over the site soils. Therefore, the risks identified in the risk assessment represent maximum, worst-case scenarios as contamination at portions of the site has been subsequently addressed in three removal actions.

The objectives of the HHRA were to:

1. Identify COCs in surface and subsurface soil, groundwater, surface water, and sediment.
2. Identify potential current and future human exposures that should be prevented.
3. Estimate current potential human health risks associated with exposures to COCs identified in the evaluated media if no remedial action is taken.
4. Estimate future potential human health risks associated with potential exposure pathways identified.

The NCP established acceptable levels of carcinogenic risk from Superfund sites ranging from 1 excess cancer case per 10,000 people exposed to 1 excess cancer case per 1 million people exposed. Expressed as scientific notation, this risk range is between 10^{-4} and 10^{-6} . Remedial action is warranted at a site when the calculated cancer risk level exceeds 10^{-4} . However, since USEPA's cleanup goal is generally to reduce the risk to 10^{-6} or less, USEPA generally recommends action where the risk is within the range between 10^{-4} and 10^{-6} .

The NCP also states that sites should not pose a health threat due to a noncarcinogenic, but otherwise hazardous chemical. USEPA defines a noncarcinogenic threat by the ratio of the contaminant concentration at the site that a person may encounter to the established safe concentration. Noncarcinogenic effects are estimated by calculating the hazard quotient (HQ) for individual chemicals and the Hazard Index (HI) for overall chemicals. If the ratio, HI, exceeds 1.0, there may be concern for the potential noncarcinogenic health effects associated with exposure to the chemicals. The HI identifies the potential for the most sensitive individuals to be adversely affected by the noncarcinogenic effects of chemicals. As a rule, the greater the value of the HI above 1.0, the greater the level of concern.

Incremental lifetime cancer risks (ILCRs) and the potential to experience noncarcinogenic adverse effects (i.e., central nervous system effects, kidney effects, etc.), as measured by an HI, were evaluated in this assessment. Estimated ILCRs were compared to the acceptable risk range of 10^{-4} to 10^{-6} . The calculated HI was compared to the threshold value of 1.0. The baseline risk assessment evaluated potential risks to the following five receptor groups:

- Current adult and adolescent (ages 7-15 years) trespassers
- Future adult construction/utility workers
- Future adult and young child (ages 1-6 years) recreational users
- Future adult groundskeepers
- Future adult and young child on-site residents

2.7.1.2 Summary of Human Health Risks

The total site carcinogenic and noncarcinogenic risks estimated for all current and future receptors evaluated in the HHRA are presented in Table 2-1 and are summarized in Appendix B. Potentially unacceptable total site risks were identified for four of the five receptors: future adult construction/utility workers, future adult and young child recreational users, future adult groundskeepers, and future adult and young child on-site residents. The total carcinogenic and noncarcinogenic risks estimated for current adult and adolescent trespassers were less than, or within, the appropriate USEPA acceptable target risk criteria. No human health risks exceeding USEPA acceptable target risk criteria were identified from Site 22 sediments. The risks identified in the risk assessment with respect to site soils represent theoretical worst-case exposure given that portions of the site were subsequently addressed in two NTCRAs. The pathway risks contributing to the potentially unacceptable total site risks are noted in Table 2-1 for all of the receptors and are summarized below.

Future Adult Construction/Utility Workers

Future Adult Construction/Utility Workers were evaluated for exposures to surface soil, subsurface soil, groundwater, surface water, and sediment COCs. The total site ILCR for this receptor group was within the USEPA's acceptable target ILCR range; however, the total site HI (8.03) exceeded the target risk value of 1.0 because of accidental ingestion of antimony, arsenic, and iron in the subsurface soil and dermal exposures to cadmium, chromium, and iron in the subsurface soil. Accidental ingestion of surface soil also demonstrated risk due primarily to arsenic and iron.

Future Adult and Young Child Recreational Users

Future Adult and Young Child Recreational Users were evaluated for exposures to surface soil, surface water, and sediment COCs. The total site ILCR for this receptor group was within the USEPA's acceptable target ILCR range; however, the total site HI for Young Child Recreational Users (1.34) slightly exceeded the target risk value of 1.0 because of accidental ingestion of Aroclor-1254, arsenic, and iron in surface soil and accidental ingestion of arsenic and iron in sediment. The total site HI for Adult Recreational Users was below the target risk value of 1.0.

Future Adult Groundskeepers

Future Adult Groundskeepers were evaluated for exposures to surface soil, subsurface soil, surface water, and sediment COCs. The total site ILCR estimated for this receptor group (1.9×10^{-4}) exceeded USEPA's acceptable target ILCR range though no individual ILCRs were greater than the target risk value. In addition, the total site HI (2.87) exceeded the target value of 1.0 due to accidental ingestion of antimony, arsenic, and iron in the subsurface soil. However, all individual HQs were less than the target risk value of 1.0, and antimony, arsenic, and iron target different organs. Therefore, the cumulative risk is actually less than an HI of 1.0, indicating that no adverse effects are expected subsequent to exposure. No risks were identified from any other media pathway.

Future Adult and Young Child On-Site Residents

Future adult and young child on-site residents were evaluated for reasonable maximum exposures (RME) and central tendency exposures to surface soil, subsurface soil, surface water, and sediment COCs. The RME evaluation is more conservative than the central tendency evaluation and was used for this HHRA. The adult RME total ILCR exceeded the target risk value due to exposure to subsurface soil though no individual ILCRs exceeded the target value. The adult RME total HI exceeded USEPA's target risk value of 1.0 due to exposure to subsurface soil, though no individual HQs exceeded 1.0. No risks were identified for adult future residents from surface soil, surface water, or sediment. The RME total site ILCR for young child on-site residents exceeded USEPA's target risk value due to accidental ingestion of arsenic and benzo(a)pyrene in subsurface soil. No risks were identified for young child future residents from surface water. The young child RME total HI exceeded USEPA's target risk value of 1.0 due to

accidental ingestion of Aroclor-1254, arsenic, and iron in the surface soil, exposure to antimony, arsenic, cadmium, chromium, and iron in subsurface soil, and exposure to arsenic, iron, and mercury in sediments.

2.7.2 Summary of Ecological Risks

A formal ecological evaluation was not performed during the Site 22 RI, as the site is highly disturbed. Additionally, the storage and salvage activities as well as demolition activities have altered many of the habitats that may have existed previously when the area was part of the original Bousch Creek drainage system. Given the limited habitat for ecological receptors, and thus limited potential for ecological exposures at and from the site, the Navy and USEPA agreed that ecological issues at the site may be resolved with remedies designed to eliminate any potential pathways to ecological receptors at, or downgradient of, the site, including Bousch Creek.

The pond area adjacent to the CASY collects storm water runoff from the areas south of Site 22. A concrete storm sewer carries the runoff from the pond area across Site 22 to a ditch on the north side of the site, which leads to Bousch Creek. In 2002, the storm sewer was flushed and all sediments were removed. A permanent sediment trap was installed to minimize movement of pond sediments into the storm sewer system.

A Streamlined Ecological Screening was performed for the CASY pond to evaluate potential risks to ecological receptors under existing site conditions, assuming that no remediation occurs. However, based on the concentration, frequency of detection, and risk characterization results, inorganic, pesticide, and PCB concentrations in sediment warranted further actions to prevent or lessen the potential impact to the environment (Baker, 2003). Potential exposure to environmental receptors has been greatly reduced by the installation of the soil cover over the contaminated pond sediments.

The proposed future use of Site 22 is as a recreational area that will include ballfields and soccer fields. The additional fill that would be placed during the construction of the ballfields (above the existing one-foot soil cover) would further reduce the exposure pathway of terrestrial organisms to contaminants.

2.7.3 Risk Management Approach

As shown in Table 2-1, the HHRA for Site 22 indicates that four of the five receptor scenarios present unacceptable human health risks. Using this information, the Navy developed the following risk management approach for potential human health and ecological risks at the site:

1. Site 22 will not be developed for residential use, which means that cleanup goals for the site will not consider the on-site resident receptor scenarios.
2. The Navy, USEPA, and VDEQ have agreed on cleanup goals for metals-contaminated soil, based on providing acceptable human health risks in a recreational scenario. These soil cleanup goals are presented in Section 2.8.1.

2.8 Remedial Action Objectives

Media-specific RAOs were developed for Site 22 that are protective of human health and the environment. These RAOs were considered and discussed by the NSN Partnering Team, over the course of several months, and are based on the results of the RI Report, FS Report, and the HI-IRA. The RAOs also consider the NTCRAs which addressed PCB- and metals-contaminated soil and sediment. Based on an evaluation of site conditions, risks, and legal requirements, specific RAOs were identified to protect human health and the environment. These objectives are to:

- Reduce the threat of the covered soil from becoming a potential source of contamination to human and ecological receptors.
- Reduce the threat of the covered sediment from becoming a potential source of contamination to ecological receptors in the pond area.

2.8.1 Site Remediation Goals

A review of the HHRA indicates that the contaminants that have the potential to present the greatest risk (i.e., the “risk drivers”) from exposure to soil include: antimony, arsenic, iron, and lead. The soil cleanup goals for each metal at the site are provided in Table 2-2. These cleanup goals were based on meeting an ILCR of 1.0×10^{-4} to 1.0×10^{-6} and a HI of 1.0. Cleanup goals were not established for sediment as no human health risks were identified.

2.9 Description of Remedial Alternatives

Detailed analyses of the possible remedial alternatives for soil and sediment at the site were conducted as part of the FS Report (Baker, 2002a), the two soil EE/CAs (Baker, 1997 and 2002b), and the pond area sediment EE/CA (Baker, 2003). These analyses were conducted in accordance with the USEPA document entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* and the NCP (USEPA, 1988).

In accordance with CERCLA, only those remedial alternatives that attain or exceed ARARs were considered. The purpose of this requirement is to make CERCLA response actions consistent with other pertinent Federal and State environmental requirements. ARARs that were considered for the remedial alternatives are discussed in Tables 2-1 and 2-2 of the CASY Feasibility Study and were met during the execution of the three NTCRAs. The potential location-specific ARARs that were considered for this ROD are included in Appendix A.

A summary of the remedial alternatives evaluated for soil and sediment following the implementation of the removal actions is presented below.

2.9.1 Soil Remedial Alternatives

The primary contaminants of concern remaining in Site 22 soil are antimony, arsenic, iron, and lead. The following two remedial alternatives were considered for site soil (designated in this ROD as SOs) to address contamination left in place under the one-foot soil cover constructed in 2002:

- Alternative SO-1: No Action
- Alternative SO-2: Land Use Controls

Brief descriptions of these soil remedial alternatives, as well as estimated costs, are summarized in Table 23 and are provided in detail below. Present worth costs for all alternatives were calculated over a 30-year period, using an interest rate of 5 percent.

2.9.1.1 Alternative SO-1: No Action

Description: Evaluation of the No Action Alternative is required by the NCP to provide a baseline comparison for other remediation alternatives. Under the No Action Alternative, no additional controls or remedial technologies would be implemented and no further site-related monitoring or maintenance would be conducted. Under this alternative, the remediation goals would not be met. In addition, this alternative is not compatible with the future designated use of the site as a recreational area.

Cost: There are no capital or O&M costs related to this alternative.

2.9.1.2 Alternative SO-2: Land Use Controls

Description: The LUC objectives for the soil are:

- Prohibit the development and use of the property for residential housing, elementary and secondary schools, child-care facilities, or other activities that would pose an unacceptable risk to human and environmental receptors.
- Ensure no construction and maintenance activities, including activities that involve digging into the existing soil cover, are undertaken until the Navy institutes adequate base procedures to ensure the integrity of the soil cover. These base procedures must be in place within 90 days of ROD signature. Within this 90-day timeframe, if the Navy wishes to engage in digging or maintenance activities that impact the soil cover, the Navy must secure USEPA and VDEQ concurrence.

The site is currently not used for residential purposes, and there are no plans to close the base or to convert the area to residential use. The planned future use of the facility is as a recreational area with baseball and softball fields. The LUCs will remain until contaminant levels diminish so as to allow unrestricted use and unlimited exposure. Within 90 days following the execution of this ROD, the Navy shall develop, and submit to the USEPA and VDEQ, in accordance with the Federal Facilities Agreement, a Remedial Design that shall provide for land use control implementation and maintenance actions, including periodic inspections and reporting, to ensure that residential development will not be allowed on the site. The Navy will implement, maintain, monitor, and enforce the LUCs according to the Remedial Design. These actions will reduce unacceptable risks to receptors by eliminating direct exposure to contaminated soil and sediment.

Cost: The estimated costs of Alternative SO-2 are as follows:

- Capital: \$5,600
- Annual O&M: \$8,000
- Net present worth (30-year): \$130,000

2.9.2 Sediment Remedial Alternatives

Remedial alternatives were developed for sediment in the pond area adjacent to the CASY to address the potential for exposure to contamination left in place under the one-foot sediment cover constructed in 2003. As previously noted, surface water has been included with the sediment for purposes of alternative development and evaluation. The following two remedial alternatives were considered for site sediment (designated in this ROD as SDs) to address contamination left in place under the one-foot sediment cover constructed in 2003.

- Alternative SD-1: No Action
- Alternative SD-2: Land Use Controls

Brief descriptions of these sediment remedial alternatives, as well as estimated costs, are summarized in Table 2-3 and are provided in detail below. Present worth costs for all alternatives were calculated over a 30-year period, using an interest rate of 5 percent.

2.9.2.1 Alternative SD-1: No Action

Description: Evaluation of the No Action Alternative is required by the NCP to provide a baseline comparison for other remediation alternatives. Under the No Action Alternative, no additional sediment controls or remedial technologies would be implemented and no further site-related monitoring or maintenance would be conducted. Under this alternative, the remediation goals would not be met.

Cost: There are no capital or O&M costs related to this alternative.

2.9.2.2 Alternative SD-2: Land Use Controls

Description: The LUC objectives for the sediment are:

- Prohibit the development and use of the property for residential housing, elementary and secondary schools, child-care facilities, or other activities that would pose an unacceptable risk to human and environmental receptors.
- Ensure no construction and maintenance activities, including activities that involve digging into the existing soil cover, are undertaken until the Navy institutes adequate base procedures to ensure the integrity of the soil cover. These base procedures must be in place within 90 days of ROD signature. Within this 90-day timeframe, if the Navy wishes to engage in digging or maintenance activities that impact the soil cover, the Navy must secure USEPA and VDEQ concurrence.
- Ensure no work on the storm drainage system or around the pond occurs without the use of appropriate worker precautions.

The site is currently not used for residential purposes, and there are no plans to close the base or to convert the area to residential use. The LUCs will remain until contaminant levels diminish so as to allow unrestricted use and unlimited exposure. Within 90 days following the execution of this ROD, the Navy shall develop, and submit to the USEPA and VDEQ, in accordance with the Federal Facilities Agreement, a Remedial Design that shall provide for land use control implementation and maintenance actions, including periodic inspections and reporting, to ensure that residential development will not be allowed on the site. The Navy will implement, maintain, monitor, and enforce the LUCs according to the Remedial Design. These actions will reduce unacceptable risks to receptors by eliminating direct exposure to contaminated soil and sediment.

Cost: The estimated costs of Alternative SD-2 are as follows:

- Capital: \$2,700
- Annual O&M: \$1,200
- Net present worth (30-year): \$21,000

2.10 Summary of Comparative Analysis of Alternatives

As required by the NCP, 40 CFR 333.430(f)(5)(i), nine evaluation criteria were used to assess the alternatives for soil and sediment at Site 22. These nine criteria fall into three categories: threshold, primary balancing, and modifying, as outlined in the USEPA document entitled, *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA, 1999). All alternatives are evaluated against threshold and primary balancing criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility. Threshold criteria must be met for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major trade-offs among alternatives. Typically, the modifying criteria are evaluated after any

public comment is received on the Proposed Plan. Table 2-4 lists the nine criteria and a description of each criterion.

2.10.1 Comparison of Soil Alternatives

The following information summarizes and compares the remedial alternatives developed for soil using the nine evaluation criteria. Table 2-5 summarizes the remedial alternatives.

2.10.1.1 Overall Protection of Human Health and the Environment

The land use controls provided in Alternative SO-2 would provide a high degree of overall protection by ensuring that the site is used appropriately in the future. The No Action Alternative, SO-1, is not protective of human health and the environment nor is it compatible with the future designated use of the site (i.e. as a recreational area).

Neither soil alternative would provide active actions to minimize leaching of any contaminants from soil to groundwater. However, based on the results of the RI Report and subsequent monitoring, no leaching of COCs to groundwater has been detected. In addition, the installation of a soil cover over the entire 22-acre site in 2002 has further decreased the potential of contaminant leaching.

2.10.1.2 Compliance with ARARs

There are no chemical- or action-specific ARARs associated with Alternatives SO-1 or SO-2. The potential location-specific ARARs that were considered for this ROD are included in Appendix A.

2.10.1.3 Long-Term Effectiveness and Permanence

Alternative SO-2 would allow for the future planned use of the site as a recreational area and the remedial design would include monitoring and maintenance to ensure protectiveness and permanence. Alternative SO-2 would be an effective solution because it will minimize exposure to potential contaminants within the site, which is the RAO for soil. Alternative SO-1 provides no long-term effectiveness or permanence and does not meet the RAO for soil at the site.

2.10.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Neither alternative would reduce the toxicity, mobility, or volume of potential contaminants through active treatment. However, as previously stated, two NTCRAs were performed which greatly reduced the volume of the PCB- and metals-contaminated soil at the site. Alternative SO-2 would reduce exposure to the contamination remaining; Alternative SO-1 would not reduce exposure.

2.10.1.5 Short-Term Effectiveness

Short-term risks to human health or the environment would not be of concern during the implementation of either alternative. No active remedial actions are planned for soil other than maintenance and administrative actions associated with land use restrictions.

2.10.1.6 Implementability

Implementability is not an issue of concern for either alternative.

2.10.1.7 Cost

The 30-year net present worth costs for the two soil alternatives are summarized below.

- Alternative SO-1: \$0
- Alternative SO-2: \$130,000

2.10.1.8 State Acceptance

The Commonwealth of Virginia was involved in the selection of the soil remedy for Site 22. Information regarding remedy selection was conveyed to the Commonwealth through RAB meetings, the two EE/CAs, the NSN Partnering meetings, and at the public meeting held after issuance of the Proposed Plan. The Commonwealth submitted no comments regarding the proposed final remedy. The Commonwealth concurs with the selected soil remedy.

2.10.1.9 Community Acceptance

No written comments, concerns, or questions were received by the Navy, USEPA, or the Commonwealth of Virginia during the public comment period from February 8, 2004 through March 7, 2004. A public meeting was held on March 2, 2004 to present the Proposed Plan for Site 22 and to answer questions on the Proposed Plan and on the documents in the information repositories. No one from the public participated in the public meeting.

2.10.2 Comparison of Sediment Alternatives

The following information summarizes and compares the remedial alternatives developed for sediment using the nine evaluation criteria. Table 2-6 summarizes the remedial alternatives.

2.10.2.1 Overall Protection of Human Health and the Environment

With respect to potential contamination of sediments, Alternative SD-2 would provide protection through the use of land use controls. The No Action Alternative, Alternative SD-1, is not protective of the environment.

2.10.2.2 Compliance With ARARs

There are no chemical- or action-specific ARARs associated with Alternatives SD-1 or SD-2. The potential location-specific ARARs that were considered for this ROD are included in Appendix A.

2.10.2.3 Long-Term Effectiveness and Permanence

No risks were identified for current or future land use scenarios from sediment. Therefore, both alternatives would currently be protective of human health with respect to sediment.

2.10.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Neither alternative would reduce the toxicity, mobility, or volume of potential contaminants through active treatment. However, as previously stated, a NTCRA was performed which greatly reduced the exposure to contaminated sediment at the site. Alternative SD-2 would reduce exposure to the contamination remaining; Alternative SD-1 would not reduce exposure.

2.10.2.5 Short-Term Effectiveness

Short-term risks to human health or the environment would not be of concern during the implementation of either alternative. No active remedial actions are planned for sediment other than maintenance and administrative actions associated with land use restrictions.

2.10.2.6 Implementability

Implementability is not an issue of concern for either alternative.

2.10.2.7 Cost

The 30-year net present worth costs for the sediment alternatives are summarized below.

- Alternative SD-1: \$0
- Alternative SD-2: \$21,000

2.10.2.8 State Acceptance

The Commonwealth of Virginia was involved in the selection of the sediment remedy for Site 22. Information regarding remedy selection was conveyed to the Commonwealth through RAB meetings, the EE/CA, the NSN Partnering meetings, and at the public meeting held after issuance of the Proposed Plan. The Commonwealth submitted no comments regarding the proposed final remedy. The Commonwealth concurs with the selected sediment remedy.

2.10.2.9 Community Acceptance

No written comments, concerns, or questions were received by the Navy, USEPA, or the Commonwealth of Virginia during the public comment period from February 8, 2004 through March 7, 2004. A public meeting was held on March 2, 2004 to present the Proposed Plan for Site 22 and to answer questions on the Proposed Plan and on the documents in the information repositories. No one from the public participated in the public meeting.

2.11 **Principal Threat Wastes**

The NCP establishes an expectation that the USEPA will use treatment to address the principal threats posed by a site whenever practicable. Principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. There are no principal threat wastes present at Site 22.

2.12 **The Selected Remedy**

The selected remedies for contaminated soil and sediment at Site 22 are identified below:

- **Soil:** Alternative SO-2 - Land use controls.
- **Sediment:** Alternative SD-2 - Land use controls.

2.12.1 Selected Soil Alternative

The selected soil remedial alternative at Site 22 is Alternative SO-2, land use controls as described in Section 2.9.1.2.

Cost: The estimated costs of Alternative SO-2 are:

- Capital: \$5,600
- Annual O&M: \$8,000
- Net present worth (30-year): \$130,000

2.12.2 Selected Sediment Alternative

The selected sediment remedial alternative at Site 22 is Alternative SD-2, land use controls as described in Section 2.9.2.2. Land use control boundaries are shown in Figure 2-4. As previously noted, surface water has been included with sediment for purposes of alternative developments and evaluation.

Cost: The estimated costs of Alternative SD-2 are:

- Capital: \$2,700
- Annual O&M: \$1,200
- Net present worth (30-year): \$21,000

2.13 Statutory Determinations

The selected remedy must satisfy the statutory requirements of CERCLA Section 121, which include:

- Protection of human health and the environment
- Compliance with ARARs (or justification of a waiver)
- Cost-effectiveness
- Utilization of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable
- Preference for treatment as a principal element of the remedy to the extent practicable

The evaluation of how the selected remedy for Site 22 satisfies these requirements is presented below.

2.13.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by preventing exposure to contaminants and by reducing the potential mobility of the contaminated media. The land use controls will ensure the minimization of exposure in the long-term. Soil and sediment will be managed through the covers, minimizing the potential for direct human and ecological exposure to metals. In addition to the on-going remedial activities of the CAL groundwater remediation system, the selected remedial action will afford a high level of protection through the use of land use controls.

2.13.2 Compliance with ARARs

There are no chemical- or action-specific ARARs associated with the selected remedy. The potential location-specific ARARs that were considered for this ROD are included in Appendix A.

2.13.3 Cost-Effectiveness

The selected remedy is cost-effective and represents a reasonable value for the money to be spent. A remedy was considered cost-effective if its costs were proportional to its overall effectiveness. This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria. Overall effectiveness was evaluated by assessing balancing criteria in combination. Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of these remedial alternatives was determined to be proportional to its costs and hence these alternatives represent a reasonable value for the money to be spent.

The total present worth cost of the selected remedy in this ROD is \$151,000. The selected remedy is cost-effective because it provides maximum protection of human health and the environment that is proportional to the cost.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria.

The Navy, USEPA, and the State determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at Site 22. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Navy, USEPA, and the State determined that the selected remedy provides the best balance of tradeoffs in terms of the balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against offsite treatment and disposal, and considering state and community acceptance.

The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at this site. The selected remedy provides the best balance or tradeoffs as compared to the other alternative.

2.13.5 Preference for Treatment as a Principal Element

The use of a treatment alternative for soil and sediment, in lieu of disposal, is not cost-effective or practicable for this site.

2.14 Documentation of Significant Changes

No significant changes to the remedy have been made since the time it was presented as the preferred alternative in the Proposed Plan.

3.0 RESPONSIVENESS SUMMARY

3.1 Overview

Public input is a key element in the decision making process. The Proposed Plan was made available on February 8, 2004. In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from February 8, 2004 through March 7, 2004, for the proposed remedial action described in the Proposed Plan for Site 22.

The Proposed Plan was available to the public in the administrative record for NSN. The information repository for the administrative record is maintained at the following location:

Kim Memorial Branch
Norfolk Public Library
301 East City Hall Avenue
Norfolk, Virginia 23510S
(757) 664-7323

A public meeting was held on March 2, 2004, at the Navy Lodge to formally present the Proposed Plan for Site 22. Public notice of the meeting and availability of documents was placed in *The Virginian Pilot* newspaper on February 8, 2004. Navy representatives were available to present the Proposed Plan for Site 22 and to answer any questions on the Proposed Plan and on the documents in the information repository. No one from the public attended the public meeting.

3.2 Background on Community Involvement

As part of the ongoing Community Relations Program for NSN, community interviews were conducted to provide information on site activities and to encourage community involvement. The Navy has established a RAB for the Naval Station to provide a forum for cooperation between Navy, regulatory, and community representatives. The RAB meets regularly to update members on the Navy's ongoing and planned remedial activities associated with the IRP.

3.3 Summary of Comments Received During the Public Comment Period

The public comment period on the Proposed Plan began on February 8, 2004 and ended on March 7, 2004. No comments were received from the public during the public comment period.

4.0 REFERENCES

- Baker. 2003. Final Action Memorandum for Contaminated Sediment in the Pond Area. Camp Allen Salvage Yard, Site 22. Naval Station Norfolk, Norfolk, Virginia. Contract N62470-95-D-6007. CTO-199. July 2003.
- Baker. 2002a. Final Feasibility Study for Camp Allen Salvage Yard. Naval Station Norfolk, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-353. May 2002.
- Baker. 2002b. Final Action Memorandum for Metals Contaminated Soil. Camp Allen Salvage Yard, Site 22. Naval Station Norfolk, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-353. April 2002.
- Baker. 2001. Camp Allen Salvage Yard Metals Hot Spot Investigation. Naval Station Norfolk, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-353.
- Baker. 1999. Remedial Investigation/Risk Assessment Report for Camp Allen Salvage Yard. Naval Station Norfolk, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-353. November, 1999.
- Baker. 1997. Final Engineering Evaluation/Cost Analysis For PCB-Contaminated Soil. Camp Allen Salvage Yard. Norfolk Naval Base, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-353.
- Baker. 1995. Final Decision Document for the Camp Allen Landfill. Norfolk Naval Base, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-084. July 1995.
- Baker. 1994a. Final Camp Allen Landfill RI Report. Norfolk Naval Base, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-084. July 1994.
- Baker. 1994b. Final Camp Allen Landfill Feasibility Study. Norfolk Naval Base, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-084. November 1994.
- Baker. 1993. Preliminary Assessment/Site Inspection Report. Camp Allen Salvage Yard, Norfolk, Virginia. Contract N62470-89-D-4814. CTO-084.
- CH2M Hill. 2000. Draft Soil Background Investigation Report. Naval Station Norfolk. 2000.
- Navy Energy and Environmental Support Activity. 1983. Initial Assessment Study of Sewells Point Navy Complex, Norfolk, Virginia. NEESA 13-016. February 1983.
- USEPA. 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. Final. EPA/540-R-98-031. July 1999.
- USEPA. 1998. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part D, Standardizing Planning, Reporting, and Review of Superfund Risk Assessments). Interim Final. Publication 9285.7-01D. January 1998.
- USEPA. 1989. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. December 19-89.
- USEPA. 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Interim Final. EPA/540/G-89/004. October 1988.

USEPA and the United States Department of the Navy. 1999. Federal Facility Agreement. Naval Base Norfolk, Norfolk, Virginia. Administrative Docket Number: III-FCA-CERC-015.

Table 2-1
Summary of Total Site Human Health Risks
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Receptors	Adult		Young Child/Adolescent	
	Total ILCR	Total HI	Total ILCR	Total HI
Current Adult and Adolescent Trespassers ⁽¹⁾	2.0E-05	0.15	9.3E-06	0.21
Future Adult Construction/Utility Workers ⁽²⁾	2.0E-05	8.03	NA	NA
Future Adult and Young Child Recreational Users ⁽³⁾	4.2E-05	0.30	3.6E-05	1.34
Future Adult Groundskeepers ⁽⁴⁾	1.9E-04	2.87	NA	NA
Future Adult and Young Child On-Site Residents - RME ⁽⁵⁾	1.7E-04	3.09	2.2E-04	15.94
Notes: RME - Reasonable Maximum Exposure Shading indicates exceedances of USEPA acceptable target risk criteria. This table reflects the elimination of samples SYD-14S and SYD-14W. (1) Current trespassers were evaluated for exposure to surface soil, surface water, and sediment COCs. (2) Future construction/utility workers were evaluated for exposure to surface soil, subsurface soil, groundwater, surface water, and sediment COCs. (3) Future recreational users were evaluated for exposure to surface soil, surface water, and sediment COCs. (4) Future groundskeepers were evaluated for exposure to surface soil, subsurface soil, surface water, and sediment COCs. (5) Future on-site residents were evaluated for exposure to surface soil, subsurface soil, surface water, and sediment.				

Table 2-2
Soil Cleanup Goals
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Contaminant	Cleanup Goal (ppm)	Justification
Antimony	41 ppm	Based on providing an HQ of 0.5 for construction worker
Arsenic	28 ppm	Based on background concentration ⁽¹⁾ , provides an HQ of 0.5 for child recreational user
Iron	31,100 ppm	Based on providing an HQ of 0.5 for construction worker
Lead	400 ppm	USEPA Residential Action Level
Notes: ppm - Parts Per Million HQ - Hazard Quotient (1) CH2M Hill, 2000		

Table 2-3
Remedial Alternatives
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Alternative	Main Components	Applicable Standards	Present Worth Cost
SO-1: No Action	<ul style="list-style-type: none"> Existing soil cover (one-foot soil cover over 22-acre site) 	<ul style="list-style-type: none"> Not effective in the long-term in protecting human health or the environment Not compatible with anticipated future land use No applicable or relevant ARARs following NTCRAs 	\$0
SO-2: Institutional Controls Plus Land Use Control Planning	<ul style="list-style-type: none"> Existing soil cover (one-foot soil cover over 22-acre site) Institutional controls including construction restrictions Periodic soil cover inspections and maintenance Land use control planning 	<ul style="list-style-type: none"> Protective of human health and the environment via exposure minimization No applicable or relevant ARARs following previous NTCRAs 	\$130,000
SD-1: No Action	<ul style="list-style-type: none"> Existing sediment cover (one-foot sediment cover with cellular concrete block system) 	<ul style="list-style-type: none"> Not effective in the long-term in protecting the environment Not compatible with anticipated future land use No applicable or relevant ARARs following NTCRA 	\$0
SD-2: Institutional Controls Plus Land Use Control Planning	<ul style="list-style-type: none"> Existing sediment cover (one-foot sediment cover with cellular concrete block system) Installation of 1,000 linear feet of fencing around pond Installation of warning signs Institutional controls including construction restrictions Periodic sediment cover inspections and maintenance Land use control planning 	<ul style="list-style-type: none"> Protective of the environment via exposure minimization No applicable or relevant ARARs following previous NTCRA 	\$21,000

Table 2-4
Summary of Evaluation Criteria
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Threshold Criteria	Overall Protection of Human Health and the Environment - addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
	Compliance with ARARs - addresses whether or not an alternative will meet all of the ARARs or other Federal and State environmental statutes and/or provide grounds for invoking a waiver.
Primary Balancing Criteria	Long-Term Effectiveness and Permanence - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
	Reduction of Toxicity, Mobility, or Volume Through Treatment - is the anticipated performance of the treatment options that may be employed in an alternative.
	Short-Term Effectiveness - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment during the construction and implementation period.
	Implementability - is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.
Modifying Criteria	Cost - includes capital and operation and maintenance costs, and for comparative purposes, net present worth values.
	USEPA/State Acceptance - indicates whether, based on review of the RI and FS Reports and the Proposed Plan, the USEPA and State concur with, oppose, or have no comments on the preferred alternative.
	Community Acceptance - will be addressed in the Record of Decision following a review of the public comments received on the RI and FS Reports and the Proposed Plan.

Table 2-5
Soil Alternative Comparison Summary
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Criteria	Alternative SO-1 No Action	Alternative SO-2 Institutional Controls Plus Land Use Control Planning
Overall Protection of Human Health and the Environment	No reduction in risk, not compatible with future designated use.	Alternative would provide human health protection through limiting site access and exposure to potential contamination.
Compliance with ARARs	No applicable or relevant ARARs.	No applicable or relevant ARARs.
Long-Term Effectiveness and Permanence	None.	Effective in long-term in ensuring protectiveness and permanence, minimizes potential exposures.
Reduction of Toxicity, Mobility, and Volume Through Treatment	None.	None.
Short-Term Effectiveness	No issues.	No issues.
Implementability	No issues.	Readily implementable.
Total Present Worth Cost		
Total Capital Costs	\$0	\$5,600
Annual O&M Costs	\$0	\$8,000
Total Present Worth Costs	\$0	\$130,000

Table 2-6
Sediment Alternative Comparison Summary
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Criteria	Alternative SD-1 No Action	Alternative SD-2 Institutional Controls Plus Land Use Control Planning
Overall Protection of Human Health and the Environment	No reduction in risk, not compatible with future designated use.	Alternative would provide protection through limiting site access and exposure to potential contamination.
Compliance with ARARs	No applicable or relevant ARARs.	No applicable or relevant ARARs.
Long-Term Effectiveness and Permanence	No issues.	No issues.
Reduction of Toxicity, Mobility, and Volume Through Treatment	None.	None.
Short-Term Effectiveness	No issues.	No issues.
Implementability	No issues.	Readily implementable.
Total Present Worth Cost		
Total Capital Costs	\$0	\$2,700
Annual O&M Costs	\$0	\$1,200
Total Present Worth Costs	\$0	\$21,000



LEGEND

- INSTALLATION PROPERTY BOUNDARY
- SURFACE WATER

FIGURE 2-1
SITE LOCATION MAP

SOURCE: U.S.G.S. TOPOGRAPHIC MAP, NORFOLK
NORTH QUADRANGLE, VA, PHOTOINSPECTED 1989.

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

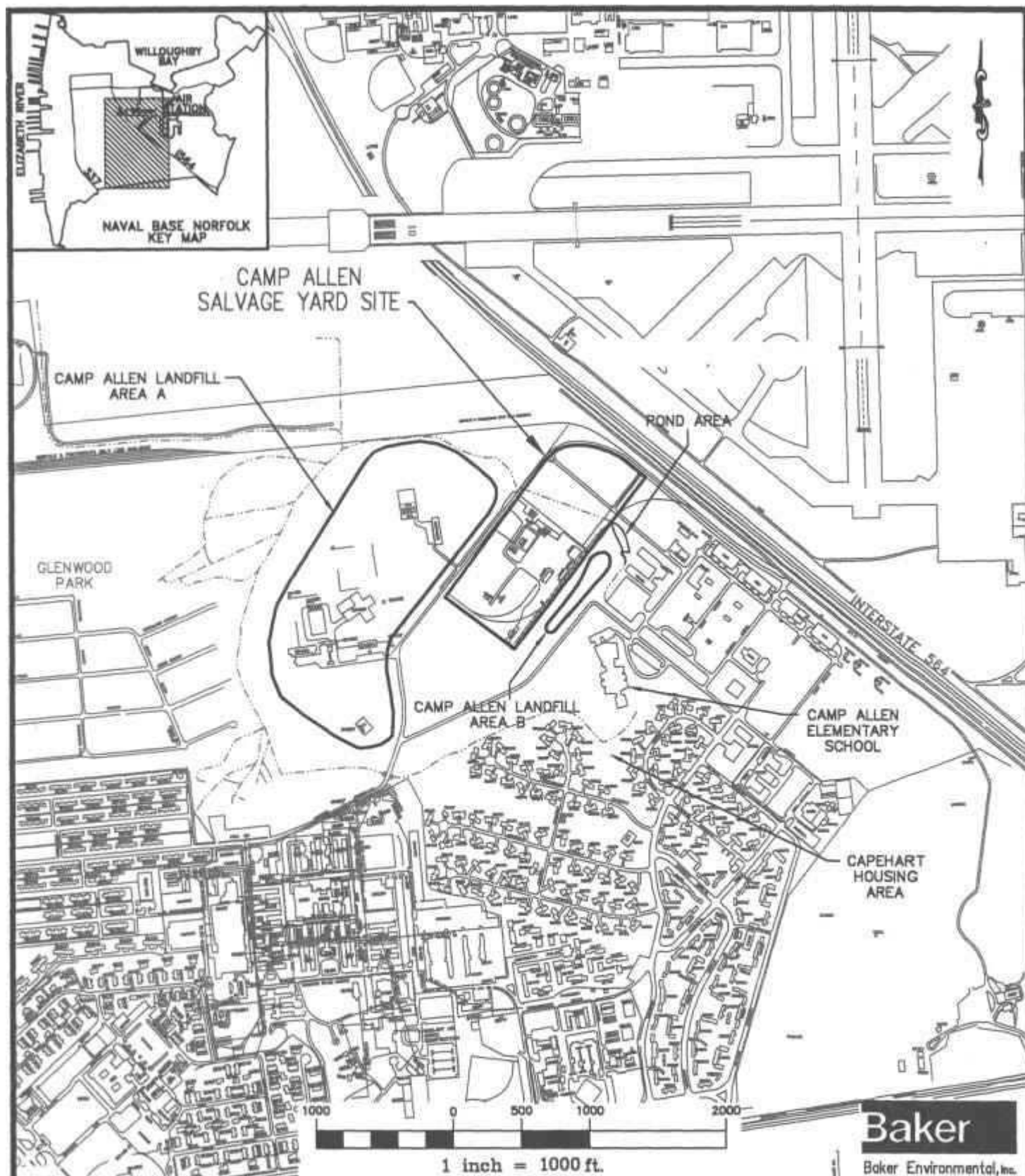
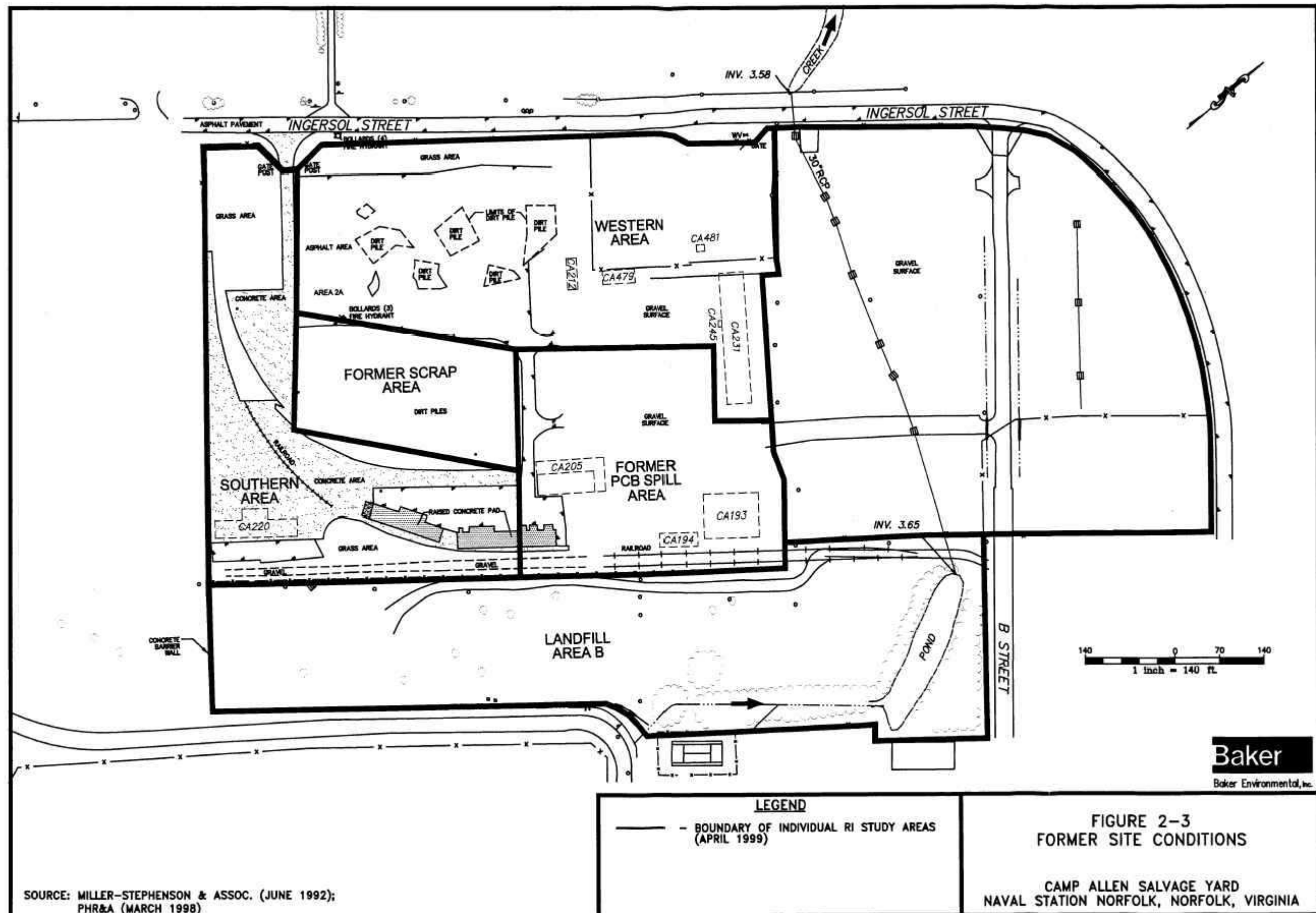
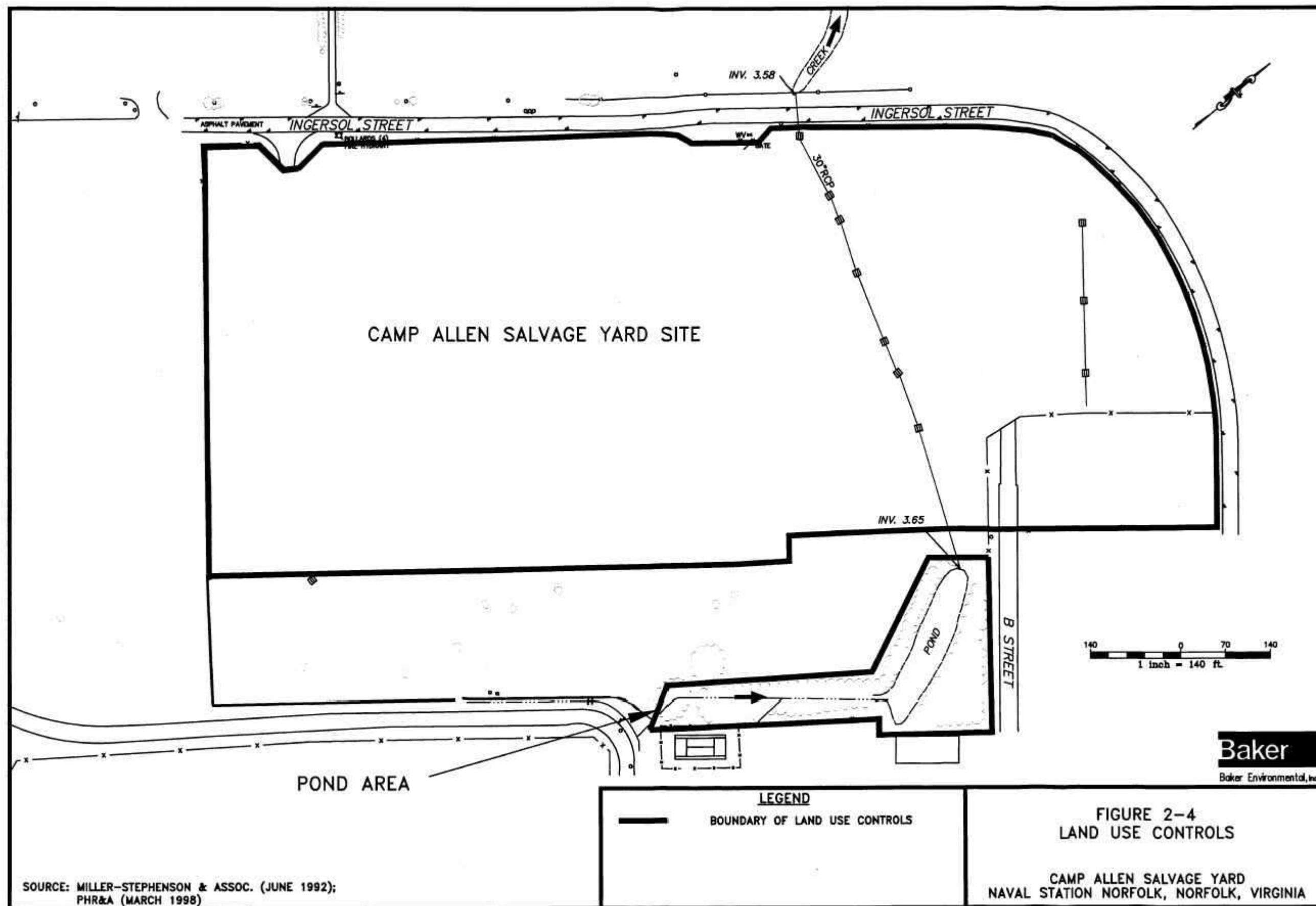


FIGURE 2-2
SITE 22 LAYOUT MAP

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

SOURCE: LAHTDIV, OCTOBER 1991





**APPENDIX A-1
FEDERAL ARARS
CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Citation	Requirement	ARAR Determination	Comments
FEDERAL/LOCATION-SPECIFIC			
The Endangered Species Act of 1973 16 USC 1531; 40 CFR Part 502; 50 CFR 81, 225, 402	Requires action to conserve endangered species and their critical habitats.	Not applicable or relevant and appropriate	No federally listed threatened or endangered species were found to exist at the site.
Coastal Zone Management Act 16 USC 3501; 16 USC 1456 (c), Section 307 (c); 16 USC 1451 et seq.; 15 CFR 930, 15 CFR 923.45	Conduct activities in a manner consistent with approved State management programs.	Not applicable or relevant and appropriate	Site 22 is located within Virginia's coastal zone. However, the remedial action will not impact the coastal zone.
National Archaeological and Historic Preservation Act 16 USC 469, 36 CFR 469	Develops procedures for the protection of significant scientific, prehistoric, or archaeological resources.	Not applicable or relevant and appropriate	No known significant historical buildings or archaeological sites have been documented in the area.
Executive Order 11998, Protection of Floodplains (related to Floodplain Management)	Regulates activities located in a floodplain. Federal activities in floodplains must reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and preserve the natural and beneficial values served by floodplains.	Not applicable or relevant and appropriate	Remedy will not have an impact on the floodplain.
Executive Order 11990, Protection of Wetlands 40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Action to minimize the destruction, loss, or degradation of wetlands.	Not applicable or relevant and appropriate	U.S. Army Corp of Engineers has determined that no wetlands are present at the site.
Clean Water Act, Section 404 40 CFR 230, 40 CFR 231	Action to prohibit discharge of dredged or fill material into wetland without permit	Not applicable or relevant and appropriate	U.S. Army Corps of Engineers has determined that no wetlands are present at the site.
RCRA Subtitle C Landfills (40 CFR 264, Subpart N)	Regulates owners and operators of facilities that dispose hazardous wastes in landfills.	Not applicable or relevant and appropriate	Response action will not involve off site disposal of hazardous waste (soils, sediments or IDW) at landfills.
Migratory Bird Treaty Act of 1972 16 USC Section 703	Protects almost all species of native birds in the U.S. from unregulated "taking" which can include poisoning at hazardous waste sites.	Applicable	Migratory birds have been seen near Site 22. The requirements are applicable to any response action that could result in unregulated "taking" of native birds. The remedy complies with the requirements of this Act.

APPENDIX A-1 (Continued)
FEDERAL ARARS
CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Citation	Requirement	ARAR Determination	Comments
FEDERAL/LOCATION-SPECIFIC (Continued)			
Fish and Wildlife Coordination Act Fish and Wildlife Improvement Act of 1978, Fish and Wildlife Conservation Act of 1980 16 USC 661; 16 USC 662; 16 USC 742(a); 16 USC 2901; 50 CFR 83	Provides protection for actions that would affect streams, wetlands, other water bodies, or protected habitats. Any action taken should protect fish or wildlife. Includes diversion, channeling, or other activities that modify streams or other water bodies and affects fish or wildlife.	Not applicable or relevant and appropriate	Remedial action will not impact any natural habitat.

**APPENDIX A-2
STATE ARARS
CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Citation	Requirement	ARAR Determination	Comments
STATE/LOCATION-SPECIFIC			
RCRA Subtitle C Landfills (VR 672-10, Part X, Section 10.13)	Regulates owners and operators of facilities that dispose hazardous wastes in landfills.	Not applicable or relevant and appropriate	The remedy will not involve treatment, storage, or disposal of hazardous waste.
Virginia Coastal Management Act Section 307(c) of 16 USC 1456(c); 15 CFR 930 and 923.45	All Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner that is consistent to the maximum extent practicable with the enforceable policies if approved State management programs.	Not applicable or relevant and appropriate	The remedy will have no effect on the coastal zone.
Endangered Species Code of Virginia Sections 29.1-563 through 568 4 VAC 15-20-130 to 140	Action to conserve endangered species or threatened species, including consultation with the Virginia Board of Game and Inland Fisheries.	Not applicable or relevant and appropriate	No state listed threatened or endangered species were found to exist at the site.
Virginia Natural Areas Preserves Act Code of Virginia Sections 10.1-209 through 217	Action to conserve natural preserve areas and restrict certain activities in these areas.	Not applicable or relevant and appropriate	The remedy will not impact natural preserve areas.
Virginia Wetlands Regulations (VR 450-01-0051)	Regulates activities that impact tidal wetlands.	Not applicable or relevant and appropriate	No Federal or State regulated wetlands are present on and adjacent to the site which could be impacted by the remedy for the site.
Chesapeake Bay Preservation Area Designation and Management Regulations (9 VAC 10-20-10 to 280)	Sets limitations in certain tidal and wetland areas for land-disturbing activities, removal of vegetation, use of impervious cover, E&S control, stormwater management, etc. Are applicable if the site is within an area designated by local government as a Resource Protection Area or a Resource Management Area.	Not applicable or relevant and appropriate	This requirement is not an ARAR since the area affected by the response action is not a Chesapeake Bay Preservation area or Resource Protection Area.

APPENDIX A-2 (Continued)
STATE ARARS
CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Citation	Requirement	ARAR Determination	Comments
STATE/LOCATION-SPECIFIC (Continued)			
Virginia Endangered Plant and Insect Species Act (Code of Virginia Sections 3.1-1020 to 1030) Rules and Regulations for the Enforcement of the Endangered Plant and Insect Species Act (2 VAC 5-320-10)	Action to conserve endangered or protected plant and insect species	Not applicable or relevant and appropriate	There are no rare, threatened, or endangered plant species confirmed to exist at the site.
Virginia Historic Resource Law, Virginia Antiquities Act Code of Virginia 10.1-2200 et seq.; 10.1-2300 et seq.	Relates to the nomination of sites to the National Register by the Commonwealth. Prohibits the taking of antiquities on state-controlled lands	Not applicable or relevant and appropriate	There are no historic properties on Site 22.
General Provisions Relating to Marine Resources Commission, Wetlands Mitigation, Compensation Policy, Wetlands, 4 VAC 20-390-10 to 50	Requires that any activity that impacts wetlands meet the provision of the Virginia Wetlands Act and regulations.	Not applicable or relevant and appropriate	U.S. Army Corps of Engineers has determined that there are no regulated wetlands at Site 22.
Water Resources Policy, Wetlands 9 VAC 25-390-10 et seq	Requires protection of wetlands (Spoils produced from original dredging and channel maintenance projects should not be disposed of in any manner that would in itself adversely modify circulation in wetlands, both tidal and nontidal).	Not applicable or relevant and appropriate	U.S. Army Corps of Engineers has determined that there are no regulated wetlands at Site 22.
Virginia State Water Control Laws and Virginia Wetlands Regulations, Wetland Virginia Code Sections 62.1-44.15:5	Action to minimize the destruction, loss, or degradation of wetlands.	Not applicable or relevant and appropriate	U.S. Army Corps of Engineers has determined that there are no regulated wetlands at Site 22.

APPENDIX B
INCREMENTAL LIFETIME CANCER RISKS AND HAZARD INDICES

Appendix B -1
Total Site Incremental Lifetime Cancer Risks and
Hazard Indices for Current and Future Potential Human Receptors
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Receptors	Adult		Young Child/Adolescent	
	Total ILCR	Total HI	Total ILCR	Total HI
Current Adult and Adolescent Trespassers ⁽¹⁾	2.0E-05	0.15	9.3E-06	0.21
Future Adult Construction/Utility Workers ⁽²⁾	2.0E-05	8.03	NA	NA
Future Adult and Young Child Recreational Users ⁽³⁾	4.2E-05	0.30	3.6E-05	1.34
Future Adult Groundskeepers ⁽⁴⁾	1.9E-04	2.87	NA	NA
Future Adult and Young Child On-Site Residents-RME ⁽⁵⁾	1.7E-04	3.09	2.2E-04	15.94
Future Adult and Young Child On-Site Residents-CT ⁽⁵⁾	8.9E-05	1.57	9.2E-05	6.27

Notes:

Shading indicates exceedances of USEPA acceptable target risk criteria

This table reflects the elimination of samples SYD-14S and SYD-14W.

- (1) Current adult and adolescent trespassers were evaluated for exposures to surface soil, surface water, and sediment COCs
- (2) Future adult construction/utility workers were evaluated for exposure to surface soil, subsurface soil, groundwater, surface water, and sediment COCs
- (3) Future adult and young child recreational users were evaluated for exposures to surface soil, surface water, and sediment COCs
- (4) Future adult groundskeepers were evaluated for exposures to surface soil, subsurface soil, surface water, and sediment COCs
- (5) Future adult and young child on-site residents were evaluated for exposure to surface soil, subsurface soil, surface water, and sediment COCs

Appendix B-2
Incremental Lifetime Cancer Risks and Hazard Indices
for Current Adult and Adolescent Trespassers
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Trespassers			
	Adult		Adolescent	
	ILCR	HI	ILCR	HI
<u>Surface Soil</u>				
Ingestion	1.3E-06	0.02	7.1E-07	0.04
Dermal Contact	1.3E-06	0.04	3.7E-07	0.04
Inhalation ⁽¹⁾	5.6E-10	0.00	3.2E-10	0.00
Subtotal	2.6E-06	0.07	1.1E-06	0.08
<u>Surface Water</u>				
Ingestion	5.3E-07	0.01	3.0E-07	0.01
Dermal Contact	1.2E-06	0.01	5.2E-07	0.02
Subtotal	1.7E-06	0.02	8.2E-07	0.03
<u>Sediment</u>				
Ingestion	3.9E-06	0.02	2.2E-06	0.04
Dermal Contact	1.2E-05	0.04	5.2E-06	0.06
Subtotal	1.5E-05	0.06	7.4E-06	0.10
Total	2.0E-05	0.15	9.3E-06	0.21

Note:

⁽¹⁾ Inhalation of fugitive dust

Appendix B -3
Incremental Lifetime Cancer Risks and Hazard Indices
for Future Construction/Utility Workers
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Future Construction/Utility Worker	
	ILCR	HI
<u>Surface Soil</u>		
Ingestion	1.9E-06	1.07
Dermal Contact	4.5E-07	0.45
Inhalation ⁽¹⁾	5.6E-10	0.00
Subtotal	2.4E-06	1.52
<u>Subsurface Soil</u>		
Ingestion	7.2E-06	3.50
Dermal Contact	3.1E-06	1.51
Inhalation ⁽¹⁾	1.4E-08	0.01
Subtotal	1.0E-05	5.02
<u>Groundwater</u>		
Ingestion	2.4E-06	0.44
Dermal Contact	2.7E-06	0.73
Subtotal	5.1E-06	1.17
<u>Surface Water</u>		
Ingestion	5.6E-08	0.02
Dermal Contact	1.1E-07	0.04
Subtotal	1.6E-07	0.06
<u>Sediment</u>		
Ingestion	1.3E-06	0.21
Dermal Contact	5.9E-07	0.06
Subtotal	1.9E-06	0.27
Total ⁽²⁾	2.0E-05	8.03

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

⁽¹⁾ Inhalation of fugitive dust.

⁽²⁾ Total HI exceeded USEPA's target risk value of 1.0 due to accidental ingestion of iron, arsenic, and antimony in the subsurface soil (51.0%, 13.8%, and 11.4% risk contribution, respectively) and dermal exposures to chromium, iron, and cadmium in the subsurface soil (45.5%, 20.9%, and 20.8% risk contribution, respectively). Accidental ingestion of surface soil also demonstrated risk due primarily to iron and arsenic (20% and 18.7% risk contribution, respectively).

Appendix B -4
Incremental Lifetime Cancer Risks and Hazard Indices
for Future Adult and Young Child Recreational Users
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Recreational User of Ballfields			
	Adult		Young Child	
	ILCR	HI	ILCR	HI
<u>Surface Soil</u>				
Ingestion	2.4E-06	0.04	4.5E-06	0.42
Dermal Contact	2.5E-06	0.08	8.9E-07	0.15
Inhalation ⁽¹⁾	5.9E-09	0.00	9.5E-09	0.00
Subtotal	4.9E-06	0.13	5.4E-06	0.57
<u>Surface Water</u>				
Ingestion	1.1E-06	0.01	1.1E-06	0.06
Dermal Contact	2.5E-06	0.03	1.3E-06	0.07
Subtotal	3.6E-06	0.04	2.4E-06	0.14
<u>Sediment</u>				
Ingestion	8.4E-06	0.05	1.6E-05	0.42
Dermal Contact	2.5E-05	0.08	1.3E-05	0.21
Subtotal	3.3E-05	0.13	2.9E-05	0.64
Total ⁽²⁾	4.2E-05	0.30	3.6E-05	1.34

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures

Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

Notes:

⁽¹⁾ Inhalation of fugitive dust Total Young Child HI exceeded USEPA's target risk value of 1.0 due to accidental ingestion of Aroclor-1254, iron, and arsenic in surface soil (35.1%, 20%, and 18.7% risk contribution, respectively) and accidental ingestion of arsenic and iron in sediment

⁽²⁾ (73.9% and 24.3% risk contribution, respectively)

Appendix B -5
Incremental Lifetime Cancer Risks and Hazard Indices
for Future Groundskeepers
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Future Groundskeeper	
	ILCR	HI
<u>Surface Soil</u>		
Ingestion	1.9E-05	0.43
Dermal Contact	3.4E-06	0.13
Inhalation ⁽¹⁾	2.4E-08	0.00
Subtotal	2.3E-05	0.56
<u>Subsurface Soil</u>		
Ingestion	7.2E-05	1.40
Dermal Contact	2.3E-05	0.45
Inhalation ⁽¹⁾	1.4E-07	0.00
Subtotal	9.5E-05	1.86
<u>Surface Water</u>		
Ingestion	7.2E-05	0.00
Dermal Contact	1.1E-05	0.17
Subtotal	1.1E-05	0.17
<u>Sediment</u>		
Ingestion	6.4E-06	0.04
Dermal Contact	5.9E-05	0.23
Subtotal	6.6E-05	0.28
Total ⁽²⁾	1.9E-04	2.87

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures

Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

⁽¹⁾ Inhalation of fugitive dust.

⁽²⁾ Total HI exceeded USEPA's target risk value of 1.0 due to accidental ingestion of iron, arsenic, and antimony in the subsurface soil (51.0%, 13.8%, and 11.4% risk contribution, respectively). It should be noted, however, that all individual HQs were less than the target risk value of 1.0 and that iron, arsenic, and antimony target different organs. Therefore, the cumulative risk is actually less than an HI of 1.0, indicating that no adverse effects are expected subsequent to exposure.

Appendix B -6
Incremental Lifetime Cancer Risks and Hazard Indices
for Future Adult and Young Child Residents - RME
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Resident - RME			
	Adult		Young Child	
	ILCR	HI	ILCR	HI
<u>Surface Soil</u>				
Ingestion	1.2E-05	0.31	2.8E-05	2.92
Dermal Contact	8.5E-06	0.35	3.1E-06	0.52
Inhalation ⁽¹⁾	3.6E-08	0.00	4.3E-08	0.01
Subtotal	2.1E-05	0.67	3.1E-05	3.44
<u>Subsurface Soil</u>				
Ingestion	5.0E-05	1.02	1.2E-04	9.53
Dermal Contact	5.9E-05	1.19	2.2E-05	1.75
Inhalation ⁽¹⁾	2.1E-0	0.00	2.4E-07	0.02
Subtotal	1.1E-04	2.21	1.4E-04	11.30
<u>Surface water</u>				
Ingestion	9.2E-07	0.01	1.1E-06	0.06
Dermal Contact	2.0E-06	0.03	1.3E-06	0.07
Subtotal	2.9E-06	0.04	2.4E-06	0.14
<u>Sediment</u>				
Ingestion	1.3E-05	0.09	3.1E-05	0.85
Dermal Contact	2.0E-05	0.08	1.3E-05	0.21
Subtotal	3.3E-05	0.17	4.4E-05	1.06
Total ⁽²⁾	1.7E-04	3.09	2.2E-04	15.94

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures.

Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value.

Notes:

⁽¹⁾ Inhalation of fugitive dust.

⁽²⁾ Total Young Child HI exceeded USEPA's target risk value of 1.0 due to accidental ingestion of Aroclor-1254, iron, arsenic in the surface soil (35.1%, 19.9% and 18.7% risk contribution, respectively), accidental ingestion of iron, arsenic, and antimony in subsurface soil (51.0%, 13.8% and 11.4% risk contribution, respectively), and dermal absorption of chromium, iron, and cadmium in subsurface soil (45.5%, 20.9%, and 15.8% risk contribution, respectively). The total ILCR exceeded USEPA's target risk value of 1.0×10^{-4} due to the accidental ingestion of arsenic and benzo(a)pyrene in subsurface soil (43.5% and 36.3% risk contribution, respectively).

Appendix B -7
Incremental Lifetime Cancer Risks and Hazard Indices
for Future Adult and Young Child Residents - CT
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia

Pathway	Resident - RME			
	Adult		Young Child	
	ILCR	HI	ILCR	HI
<u>Surface Soil</u>				
Ingestion	4.0E-06	0.10	9.4E-06	0.97
Dermal Contact	5.4E-06	0.22	1.9E-06	0.31
Inhalation ⁽¹⁾	2.4E-08	0.00	2.8E-08	0.01
Subtotal	9.4E-06	0.33	1.1E-05	1.29
<u>Subsurface Soil</u>				
Ingestion	1.7E-05	0.34	3.9E-05	3.19
Dermal Contact	3.7E-05	0.75	1.3E-05	1.05
Inhalation ⁽¹⁾	1.4E-07	0.00	1.6E-07	0.01
Subtotal	5.4E-05	1.09	5.2E-05	4.24
<u>Surface water</u>				
Ingestion	9.2E-07	0.01	1.1E-06	0.06
Dermal Contact	3.8E-07	0.02	2.6E-07	0.06
Subtotal	1.3E-06	1.09	1.3E-06	0.12
<u>Sediment</u>				
Ingestion	6.7E-06	0.05	1.6E-05	0.42
Dermal Contact	1.7E-06	0.07		0.19
Subtotal	2.4E-05	0.12	2.7E-05	0.62
Total ⁽²⁾	8.9E-05	1.57	9.2E-05	6.27

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures.

Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value.

Notes:

⁽¹⁾ Inhalation of fugitive dust.

⁽²⁾ Total HI for the young child exceeded USEPA's target risk value of 1.0 due to accidental ingestion of iron, arsenic, and antimony in the subsurface surface soil (51.0%, 13.8% and 11.4% risk contribution, respectively) and dermal contact with chromium, iron, and cadmium (45.5%, 20.9%, and 15.8% risk contribution, respectively).